Claims

What is claimed is:

1. A semiconductor device, comprising:

a semiconductor die;

a thermally conductive overmolding compound disposed on the semiconductor die; and

a pin-fin heat sink mounted to a surface of the thermally conductive overmolding compound, wherein heat generated by the semiconductor die is dissipated through the thermally conductive overmolding compound to the pin-fin heat sink.

2. The semiconductor device of claim 1, wherein the semiconductor die is a power semiconductor device.

3. The semiconductor device of claim 1, wherein the overmolding compound is made with a thermally conductive epoxy.

4. The semiconductor device of claim 1, wherein the overmolding compound thermally conducts in the range of 2-5 watts/meter K.

5. The semiconductor device of claim 1 further including a leadframe supporting the semiconductor die.

6. The semiconductor device of claim 5 further including a plurality of wire bonds coupled between the semiconductor die and the leadframe.

7. The semiconductor device of claim 1, wherein the pin-fin heat sink includes a base with a plurality of pin-fins extending from the base.

8. The semiconductor device of claim 7, wherein the base includes scour lines between the pin-fins.

9. The semiconductor device of claim 1 housed in a quad flatpack no lead package, land grid array package, or ball grid array package.

10. The semiconductor device of claim 1 further including a heat slug disposed above the semiconductor die without contacting the pin-fin heat sink.

11. A semiconductor device, comprising:

a semiconductor die;

a thermally conductive overmolding compound disposed on the semiconductor die; and

a heat sink disposed on a surface of the thermally conductive overmolding compound.

12. The semiconductor device of claim 11, wherein heat generated by the semiconductor die is dissipated through the thermally conductive overmolding compound to the heat sink.

13. The semiconductor device of claim 11, wherein the semiconductor die is a power semiconductor device.

14. The semiconductor device of claim 11, wherein the overmolding compound is made with a thermally conductive epoxy.

15. The semiconductor device of claim 11, wherein the overmolding compound thermally conducts in the range of 2-5 watts/meter K.

16. The semiconductor device of claim 11, wherein the heat sink includes a base with a plurality of pin-fins extending from the base.

17. The semiconductor device of claim 16, wherein the base includes scour lines between the pin-fins.

18. The semiconductor device of claim 11 housed in a quad flatpack no lead package, land grid array package, or ball grid array package.

19. The semiconductor device of claim 11 further including a heat slug disposed above the semiconductor die without contacting the heat sink.

20. A method of manufacturing a semiconductor device, comprising:

providing a semiconductor die;

forming a thermally conductive overmolding compound over the semiconductor die; and

mounting a heat sink on a surface of the thermally conductive overmolding compound.

21. The method of claim 20, wherein heat generated by the semiconductor die is dissipated through the thermally conductive overmolding compound to the heat sink.

22. The method of claim 20, wherein the semiconductor

die is a power semiconductor device.

23. The method of claim 20, wherein the overmolding compound is made with a thermally conductive epoxy.

24. The method of claim 20, wherein the heat sink is mounted on the thermally conductive overmolding compound before final cure of the thermally conductive overmolding compound.

25. The method of claim 20, wherein the heat sink includes a base with a plurality of pin-fins extending from the base.

26. The method of claim 25, wherein the base includes scour lines between the pin-fins.

27. The method of claim 20 further including the step of housing the semiconductor device in a quad flatpack no lead package, land grid array package, or ball grid array package.

28. The method of claim 20 further including the step of disposing a heat slug above the semiconductor die without contacting the pin-fin heat sink.

29. A method of manufacturing a semiconductor device, comprising:

providing a plurality of semiconductor die;

providing a leadframe assembly;

mounting the plurality of semiconductor die to the leadframe assembly;

forming a thermally conductive overmolding compound

over the leadframe assembly; and

mounting a panel of heat sinks on a surface of the thermally conductive overmolding compound, wherein each heat sink in the panel of heat sinks is disposed over one of the plurality of semiconductor die.

30. The method of claim 29, wherein heat generated by the semiconductor die is dissipated through the thermally conductive overmolding compound to the heat sink.

31. The method of claim 29, wherein the overmolding compound is made with a thermally conductive epoxy.

32. The method of claim 29, wherein the panel of heat sinks is mounted on the thermally conductive overmolding compound before final cure of the thermally conductive overmolding compound.

33. The method of claim 29 further including the step of singulating the leadframe assembly such that the singulation cuts through the thermally conductive overmolding compound and the panel of heat sinks.

34. The method of claim 33 further including the step of forming scour lines in a base of each heat sink of the panel of heat sinks.